CLAIMS

We claim:

1. A microfluidic system, comprising:

a substrate;

a fluid network disposed on the substrate for transporting fluids; and

an electrical connection means for application of an electric potential across a first segment of the fluid network such that electroosmotic flow is induced in that segment; a coupling means for isolating electrical fields from a second segment of the fluid network while providing fluid communication between the first and second segements of the fluid network.

2. A microfluidic system as in Claim 1, wherein the fluid network comprises at least one fluid channel.

3. A microfluidic system as in Claim 1, wherein the first segment of the fluid network comprises a plurality of fluid channels operatively connected on both ends to a single fluid channel.

4. A microfluidic system as in Claim 1, wherein the electrical connection means includes a first electrode reservoir and a second electrode reservoir, each operatively connected to the first segment of the fluid network.

5. A microfluidic system as in Claim 4, wherein the second electrode reservoir includes an electrolysis free electrode for the application of electrical signals to the system without inducing electrolysis in the second reservoir.

6. A microfluidic system as in Claim 4, wherein the second electrode reservoir comprises a bubble-free electric connection joint.

7. A microfluidic system as in Claim 1, further comprising a selection means for routing fluid from the fluid network to external fluid systems.

8. A microfluidic system as in Claim 1, further comprising means for preventing contamination of fluids between the first and second segment.

9. An electrolysis free electrode, comprising:
a protective housing;
an ion transferring compound contained in a protective housing, the compound being such that electrons cannot be transferred through it nor can fluids be drawn into it.

10. An electrolysis free electrode as in Claim 9, wherein the protective housing comprises a flexible tubing.

11. An electrolysis free electrode as in Claim 9, wherein the ion transferring compound comprises one of the following compounds: agarose gel with a concentration of greater than 0.5% (w/w), polyacrylamide gel with a concentration of greater than 1% (w/w), or other polymer gel solutions, polyacrylamide gel with a weight concentration of 2-10%, sol-gel monoliths, acrylate polymer monoliths, electrolyte solution.

12. A bubble-free electric connection joint, comprising:
a substrate;
an access hole defining a first opening and a second opening disposed in the substrate;
an ion exchangeable membrane fixedly connected over the first opening of the access hole such that electrical signals is permitted to pass through the ion exchangeable membrane but fluids are retained by the membrane;
a fluid containing means fixedly connected above the ion exchangeable membrane opposite the first opening of the access hole for containing fluids;

at least one fluid channel defined in the substrate which intersects with the second opening of the access hole such that fluid contained in the fluid channel is in contact with the ion exchangeable membrane

13. A microfluidic system as in Claim 12, wherein the fluid channel intersects with the second opening of the access hole in more than one location such that fluid flows past the access hole while maintaining contact with the ion exchangeable membrane.

14. A micropippetor device comprising:
a microfabricated EOF pump; and
means for discharging fluid.